APPENDIX G

Cumulative Effects on the Gallatin National Forest

Forest Plan Elk Effective Cover Amendments

To address the potential cumulative effects to elk of multiple site-specific amendments to the Gallatin Forest Plan elk effective cover standard (also known as the habitat effectiveness index or HEI), the following analysis and discussion focuses on three questions:

1. Has there been an adverse influence on elk populations (numbers and ratios) due to the Forest's repeated HEI amendments?
2. Has there been a change in the distribution of elk due to timber harvest and associated road densities?
3. Should the Forest Service manage portions of the Gallatin National Forest at stricter open road density standards to compensate for areas where .70 HEI is not being achieved?

PURPOSE AND NEED FOR AN ELK EFFECTIVE COVER AMENDMENT

The Gallatin National Forest Land and Resource Management Plan (Forest Plan) was signed in September of 1987. The Plan included the following "standard" on page II-18:

> "4. The 1982 Elk Logging Study Annual Report contains procedures for analyzing elk habitat security as it is affected by timber harvest and road construction activities. An "elk effective cover" analysis based on this report will be conducted for timber sales and effective cover ratings of at least 70 percent will be maintained during general hunting season."

At the time the Forest Plan was signed "elk effective cover" was to be calculated using two variables; percent cover and open road density. The resultant value was known as the habitat effectiveness index, or HEI. The model was developed based on work by Thomas, et al., 1979; Perry and Overly, 1977; O'Neil, 1981, and Lyon, et al., 1985.[1] Using the "cover" variable, habitat effectiveness was optimized at a cover/forage ratio of 40/60, or in other words, when 40% of the area was in forested cover. Using the cover model only, habitat effectiveness would be 100 percent when an area contained 40% cover. At cover levels greater than 40%, habitat effectiveness actually declined. At cover levels of 100%, habitat effectiveness would only be 50%.

Using the open road density variable, habitat effectiveness was maximized when road density was 0 miles/sq. mile, or in other words, 0 miles/sq. mile equals 100% habitat effectiveness. At 6 miles/sq. mile of open road, habitat effectiveness declined to 10%. At 1.0 mile/sq. mile of open road, habitat effectiveness would be at 60%.

For purposes of the Forest Plan standard, habitat effectiveness was obtained by combining (multiplying) the cover/forage and road density effectiveness estimates. For example, if the cover/forage ratio was 50% (Cover HEI = 95%), and road density was at 1.0 miles per sq. mile (Road Density HEI = 60%) then HEI = .60 x .95 for an HEI value of 57%. Using this example then, to meet the Forest Plan standard of 70% the amount of cover should be reduced

[1] The research results cited here include a publication entitled "Coordinating Elk and Timber Management," 1/1985, by L. Jack Lyon, et. al., U.S.D.A Forest Service, Intermountain Forest And Range Experiment Station. This is the primary publication on which HEI modeling was based. My records from the time also include select pages (ii, 57, 55, and 29) from a paper entitled "Validation Testing of Elk Management Guidelines," 6/1981, by T.A. O'Neil. Page 57 describes how area effectiveness (habitat effectiveness) was obtained. Page 55 shows Lyon's cover curve. Page 29 shows the impact of traveled roads on the potential effectiveness of summer elk habitat (modified from Perry and Overly 1977) as adapted by Thomas, et al. My understanding at the time is that this was the information used to develop the HEI model for the above Forest Plan standard. I do not have the complete text of this publication nor the publications of Perry and Overly and Thomas, et al.

from 50% to 40% (Cover HEI = 100%) and open road density then reduced to approximately 0.75 miles/sq. mile (equates to a Road Density HEI of 70%).

Soon after the Forest Plan was signed, many problems with this standard became apparent during implementation (see Christiansen, April 2002):

1. The "cover curve" associated with the model actually compelled more timber harvest than would be realistic or desired. For example, if there was currently 80% cover in a 10,000 acre block of land, HEI would only be 58% at best, even with open road density at 0 miles/sq. mile. To bring HEI up to the 70% standard, 2,000 acres would have to be harvested with no new open road. It was discovered that the statistical variation of this curve was not supportable and therefore the Forest chose to modify the model such that the cover curve would not be used in calculating HEI unless cover dropped below 40%. Essentially this made HEI a road density model only and therefore restricted the amount of open road allowed for a timber sale to 0.75 miles/sq. mile.

2. There became disagreement about the analysis area on which to calculate HEI and also how to count highways, city streets, switchbacked roads and closely parallel roads. For example, a disagreement over analysis area came about in making a decision whether to include blocks of unroaded land (such as wilderness) in the calculations. The model results could easily be skewed one way or another by drawing an analysis area boundary to either purposely include or exclude blocks of unroaded land. Currently, the Forest Service uses timber compartments, bear sub-units, or other established biological units to reduce the potential for interjecting bias.

3. The various roads themselves also became a problem. When the standard was adopted roads were visualized as progressing across slope from point A to point B. In reality, it was soon discovered that there are situations where there can be longer lengths of road confined to very small areas. The City of West Yellowstone is an example where there could be 6 miles or more of city streets within a ½ square mile area. To meet the HEI standard around West Yellowstone then, there could be absolutely no additional open road within an 8 square mile area and this does not take into account the federal highways accessing the community. Note that consistency with this standard was determined considering not only National Forest System roads, but also streets, roads and highways that are outside of agency jurisdiction. Currently the problem of concentrated roads is addressed by making judgment calls on how these roads should be counted. For example, a federal highway may be counted as ½ its actual length, with the intent of including the other half in the adjacent analysis area. Closely parallel and switchbacked roads are modified based on the corridor affected.

4. Forest biologists determined that applying this standard only during the general hunting season largely defeated the security benefits that limiting open road density would have on elk security. At the time the Forest Plan was signed, the primary concern was elk vulnerability to hunting. In fact, much of the Elk Logging Study speaks to undesirable effects on elk hunting. However, the Study's recommendations focus on elk use patterns that occur at all times of the year. Therefore this standard was applied to the resultant condition that would be left after a timber sale entry.

5. It became apparent over time as timber sale entries were proposed that much of the road system that existed at the time the Forest Plan was signed did not meet the elk effective cover standard. In other words, the baseline habitat effectiveness index (HEI) was already below 70 percent. This was unanticipated but also was not initially considered to be a problem. Forest staff believed that as long as HEI improved and progressed toward 70 percent, or at least did not further reduce HEI, the proposed timber sale was consistent with the standard. This changed in the early 1990's in appeal review of the Mosquito-Denny Timber Sale decision. The Northern Regional Office reversed this decision based on non-compliance with the elk effective cover standard even though HEI would improve with implementation of the project. The rationale for reversal was that the Plan standard was 70 percent HEI and the net result of the timber sale and road closure decision was something less than that. Therefore, there were three choices to deal with this situation: (a) Change the proposal to close enough road to meet the standard. (b) Drop the project. Or (c) amend the Forest Plan. This Regional Office appeal decision was the turning point that led to the need for amendments of this standard in conjunction with timber sale proposals. In many areas, it was not

possible to close enough roads to ever meet HEI because they were not within agency jurisdiction or they provided access to private inholdings. In other cases, meeting the standard would require closure of principle popular access routes to portions of the National Forest.

6. There were 2 other problems with the implementation of this standard. One was in defining under what conditions a road should be considered "open." Would it be reasonable to count a very primitive road that may have one or two motorbikes on it per year the same as a federal highway with 2,000 cars per day. Based on a paper by Perry and Overly, Forest biologists have classified roads into primary, secondary and primitive, each given different values for purposes of running the HEI model. Depending on the project area some biologists are still giving weighted percentages to roads.

The final problem worth mentioning was in interpreting that the standard should apply not only to roads, but motorized trail. This was not a Forest-level decision but rather just a change in how HEI was modeled. Based on literature, biologists determined that modeling total open motorized route density was more indicative of the effects on elk habitat security. While biologically this was sound reasoning, it was not appropriate to include motorized trail in the model for purposes of determining compliance with the Forest Plan standard. This standard was specific to roads and that is also what was addressed in the Elk Logging Study. Although inclusion of motorized trail is more restrictive, and therefore would not be inconsistent with the standard, it does depart from the assumptions made in adopting it.

In summary, the need for a proposed amendment to this standard is largely based on the fact that it is a poorly written standard that is open to misinterpretation and misapplication. Efforts to make it work as a means to provide secure habitat for elk also make the standard more rigid than was originally intended and to an extent that appears to be unnecessary to meet habitat objectives. The Gallatin National Forest is currently undergoing a 2-year travel management planning process, that is proposed in part, to amend the Forest Plan to replace the elk effective cover standard with route-by-route decisions for management of all roads and trails. The Forest Service believes that this is a more appropriate scale of analysis to balance the habitat needs of elk and other big game with the publics' demand for recreation use and access on the road and trail system. In the interim, and for site-specific timber sales such as Darroch-Eagle Creek, the Forest Service believes it is better to propose a project-specific amendment to the standard rather than attempt to make decisions to close specific roads and trails that may later be re-opened through a decision for a travel plan.

EFFECTS OF ROAD DENSITY ON ELK

Road access or road density can have various effects (indirect, direct and cumulative) on elk and elk habitat. Roads may displace elk from an area due to vehicular use. This effect could potentially be revealed as a downward trend in the elk population. Roads may allow hunter access into an area, or the lack of roads may make hunter access difficult. These latter two items may affect the vulnerability of different sex and age classes to hunting, and thus may be revealed in the bull/cow ratio.

Lyon et al. (1985, p. 1-2) state that activity in elk habitat reduces the security of the habitat in that area**. Elk may be displaced as far as 4 miles from active timber harvest units in large timber sales where roads were open to the public. However, topographic features can provide adequate barriers between elk and activity**. Elk seem to move the minimum distance needed to avoid visual contact with workers and machinery (*Ibid*. p.38). During small sales, if roads are only open to logging traffic, **elk were generally only displaced ½ mile or less** from logging activity. The length of time an elk is displaced is directly related to the distance it was displaced (*Ibid*. p.2). Continued sporadic disturbance in a sale area can lead to longer avoidance by elk (*Ibid*. p.39). Displacement means a reduction in usable habitat and increased stress (*Ibid*. p.39). Provision of security areas can ameliorate these affects. Closed and lightly travel roads tend not to be avoided by elk (*Ibid*. p.41). Elk are very traditional in their home range, and the same animal will summer and winter in the same area every year (*Ibid.* p.3).

To have cumulative effects on elk, timber sale roads from different sales must affect the same elk. In relation to elk and timber sales, this means that if the timber harvest activity and associated roads are not occurring during the same time period ***or*** if they are more than 8 miles apart (Lyon et al. 1985) there is no potential for cumulative effects of the timber sales/roads on the same elk. Lyon et al. (1985) state that elk are more normally displaced only ½ to 2

miles, or sometimes, due to topography, they are only displaced over the nearest ridge. In addition, due to elk fidelity to a home range, and the ability to meet summer needs fairly easily in these areas, individual elk do not travel far during the summer (Lyon et al. 1985). Elk may move significant distances to winter ranges.

Methods of HEI calculation have evolved since the Forest Plan was written and have become more conservative over time (harder to meet Forest Plan standard, Christiansen 2002).

Because of the typically large distances between sale areas, there is no probability of cumulative effects among these sales on the same elk (see maps on pages 12 and 13 and Christiansen 2002). The only sales where there is the potential of cumulative effects are those in the Mill Creek drainage, the Moose/Tamphery/Swan and South Portal timber sales in the Gallatin Range, and two reasonable and foreseeable sales, West Lake and Hebgen Basin Fuels located near West Yellowstone, which are discussed below.

The following table (Table 1) presents the years of harvest activity and associated roads and provides a temporal scale for assessing potential cumulative effects of timber sale activity, including roads, on elk. Sales that are complete are in light gray for the time of sale and road opening or closing activity. Sales that are either not complete at this time (11/02) or are reasonably foreseeable are in dark gray. Reasonably foreseeable timber sales include Purdy, West Lake, Darroch/Eagle, Beaver Creek Salvage, Hebgen Basin Fuels, and Windmill. Years these sales are most likely to be active, if they finish the NEPA process, are estimated. It can be seen from the table that some of the sales overlap in time, however, most of these are located over 8 miles from each other (see map pages 12 and 13 and Christiansen 2002).

Table 1. Temporal scale of post Forest Plan timber sales and associated roads ("D" means Ranger District).

D7	'92	93	94	95	96	97	98	99	00	01	02	03	04	05
Appaloosa 7/2000-10/2000														
Taylor Fork 8/02 - present (due to finish 10/03)														
Beaver Creek Salvage 2003-2004														
West Lake 2003-2005														
Hebgen Basin Fuels projected 2004-2009														To 09
D2 Thompson Creek 10/92-8/97														
Davis Chico 5/92– 9/98														
Baldy 1/2000 to present														
Upper Mill/Emigrant 9/93-7/98														
Pole Gulch 7/99-10/02														
Windmill 2003-2005 projected														
D1 Packsaddle 11/98-4/99														
Iron Mt. 10/00 – present														
D6 Moose/Tamphery/Swan/Portal Helio 7/00-10/02, Moose Cr may go into 2003												Moose Only poss.		
Portal Creek 2001-2002														
Purdy 2003-2004														
D3 Darroch Eagle 2003-2005?														

South Portal and Moose/Tamphery/Swan (M/T/S)

The Moose/Tamphery/Swan timber sale was addressed in an E.A. and the South Portal Creek helicopter salvage sale was addressed in a separate E.A, and fell within the same years of the M/T/S sale. However, road density and HEI were unaffected by the Portal Creek sale, and South Portal met the Forest Plan standard for HEI (Appendix G). In addition, temporary public road closures were in effect during the Portal salvage operation (Portal EA pp. III.15-18). One of the compartments of the M/T/S sale met HEI and the other (Moose/Tamphery) did not (Appendix G). No cumulative effects on elk by the M/T/S timber sale and South Portal salvage sale road densities were anticipated (Portal EA pg. III-18).

The Moose/Tamphery/Swan and Portal timber sales lie within Elk Hunting District (HD) 301. Some of the elk that summer on HD 301 winter on HD314, which has winter range to the east of the northwestern part of Paradise Valley, some winter to the north along the Gallatin face, and some winter at lower elevations and south and west facing slopes in the Gallatin Canyon. The Gallatin Elk Management Unit is above its objective given in the Montana FWP Elk Plan (1992). The hunting season was liberalized this year (2002) during the first week of the season on the Madison range side (Alt, personal communication). The reason that HD 301 east of the Gallatin Canyon highway does not have a liberal opening week of the hunt is due to high accessibility adjacent to Bozeman which could lead to hunter congestion. In HD 301, there was an intentional increase in permits in order to reduce the population due to depredation problems along the Gallatin face. The herd is now at desired numbers and the anterless permit numbers have been reduced (Alt, personal communication). Bull/cow ratios and recruitment (of calves) are satisfactory.

Mill Creek Drainage

The Mill Creek drainage on the Livingston Ranger District is an area of the Forest that has had several timber sales that overlapped in time and space that can potentially have cumulative effects on the same elk. These sales include Upper Mill/Emigrant, Thompson Creek Salvage Sale, Davis/Chico, and the reasonably foreseeable Windmill timber sale. Upper Mill/Emigrant, Thompson and Davis/Chico all overlap some degree in time.

Upper Mill and Thompson overlapped in space, however, the fairly steep drainage of Passage Creek lies between the 2 sale areas. Davis/Chico is located approximately 3 miles from the closest end of Thompson Creek but there are several steep drainages, including West Fork of Mill Creek, and ridgelines located between the two sales. The topography of the Mill Creek drainage is very steep, allowing for a number of high ridges between harvest areas, very likely reducing the 4 mile maximum effect suggest by Lyon et al. (1985).

The Upper Mill timber sale area had one compartment meeting HEI and one that did not meet HEI (Appendix G). The Thompson Creek salvage sale occurred in one compartment which was closed to public use. Davis/Chico met HEI, and the proposed Windmill sale will meet HEI (Windmill DEIS 2002, pp. 3-82-90).

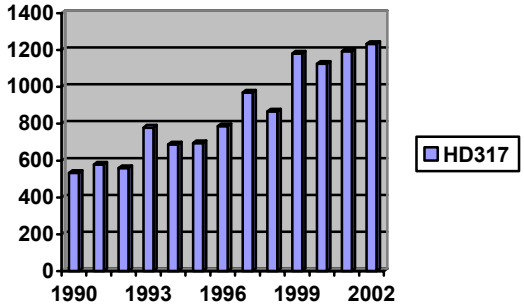
Potential effects to elk from the cumulative effects of timber sale activity occurring in the Mill Creek drainage at the same time have been mitigated by long-term road closures. The Thompson Creek salvage sale included road closures (at Snowbank campground which closed the Snowbank and Wicked Creek drainages) to compensate for loss of cover due to fire. The sale also was managed to have at least one inactive subdivision at all times (Thompson Creek E.A. pp. III-11).

Cover is generally abundant in the Mill Creek drainage due to it being heavily forested with the exception of the 1991 Thompson Creek fire area (Windmill DEIS 2002, p. 3-84). Habitat in the upper reaches of the watershed provides both good cover and elk security while older harvest units (plantations) are reaching hiding cover stage (Windmill DEIS 2002, pp. 3-82-90). Winter range for these elk occurs on private lands in the Paradise Valley (Ibid). Summer range does not appear to be limiting for any big game species in this area (Windmill DEIS 2002, pp. 3-82-90).

No other harvest activity will be occurring in the Mill Creek drainage at the time that the Windmill timber sale is active, and no permanent changes in the existing road system and road closures will occur (Windmill DEIS 2002, pp. 3-82-90). All three timber compartments in the Windmill sale area meet the Forest Plan standard for HEI (Appendix G) assuming the roads behind the gate in Counts Creek are restricted (Windmill DEIS 2002, pp. 3-85). Cover is considered sufficient in all 3 compartments, and security areas are present near the sale area (Windmill DEIS 2002, pp. 3-82-90)

In addition, the elk population trend for Elk Hunting District 317 is and has been steadily increasing since the 1970's (Lemke 2002 and Figure 1). At present, the cow elk harvest is insufficient to limit the population and prevent private land depredation (Windmill DEIS 2002, pp. 3-83). In addition, the cow/calf and bull/cow ratios for HD 37 are within expected levels. A large number of branch antlered bulls that exit the Yellowstone Park area winter on or near the face of Emigrant Peak in HD 317, and this is taken into account when counting and analyzing count results. In 2002, HD 317 had its highest elk count since annual counts commenced in 1974 (Lemke 2002). There was also a record high count for the animals considered resident elk in HD 317. The number of resident elk has tripled since 1990 (Lemke 2002). The area MFWP biologist believes that the timber sales in the Mill Creek drainage have not had a cumulative effect on elk (Lemke, personal communication).

Figure 1. Elk Hunting District 317 (Emigrant) population trend winter count (Lemke, MFWP).



West Lake and Hebgen Basin Fuels

These two timber sales, as proposed, overlap in time and are very close to one another. Elk Hunting District 361 is the area in which both the West Lake timber sale and the Hebgen Basin Fuels project are found. Although these two projects fall close in proximity on the ground they are, for the most part, inhabited by two different elk herds. The Hebgen Basin Fuels area elk are primarily those that utilize Yellowstone National Park, Cougar and Duck Creeks and the upper Madison River (Alt, personal communication). The only part of this proposed project that affects habitat of the same elk herd as the West Lake project is the portion located west of the South Fork of the Madison River. The elk that inhabit the West Lake timber sale area are part of the Henry Mountains herd. They migrate west for the winter toward the Madison Valley (Alt, personal communication). The elk herd wintering in this area (Wall Creek) is showing a dramatic upward trend in population since the 1980's, and is now over 2000 elk (K. Hamlin, MFWP). Bull/cow ratios and recruitment are satisfactory. Because of these two areas being inhabited by elk that are mostly in two different herds, the only potential for cumulative effects of these proposed projects is on the westernmost part of the Hebgen Basin Fuels project, if it occurs simultaneously to the West Lake timber sale. At this time, State FWP biologists see no population or ratio problem with either herd, therefore adverse cumulative effects are not anticipated (Alt and Hamlin, personal communication). If there are changed circumstances that would make potential cumulative effects a concern, the timing of the western part of the Hebgen Fuels project could be adjusted so as to not overlap the timing of the West Lake sale.

MONTANA STATE ELK PLAN GOALS

The State FWP is meeting elk herd population objectives for virtually all Elk Hunting Districts. Statewide, elk trends are up and recruitment is down (Hamlin, personal communication). Elk numbers are counted in the winter and these yield trend information. The winter count is only a sample of the total population, and is not a population

count. Weather, both during the flight counts and for the winter, can have a major effect on the count for that year. For instance, in a mild winter, elk may be widely dispersed and yield lower counts although the population may actually be up. Each Elk Hunting District has its own characteristics. Some contain primarily summer range and therefore yield poor winter counts. In general elk populations are at an all time high at the present (K. Hamlin, personal communication).

CONCLUSIONS

The information available from Montana FWP on elk populations, bull/cow ratio, and cow/calf ratio, indicates that the site-specific amendments to the Forest Plan HEI standard have had little effect on the elk utilizing the Gallatin National Forest. For hunting districts covering the Gallatin National Forest, elk populations in all but one (HD 310), are at State Elk Plan objectives. Hunting District 310 is located in the Taylor Fork area in the Madison Range, south and west of HD 301, and is the only hunting district on the Gallatin National Forest for which the numbers are below State Elk Plan objectives. The shortfall in this area has been determined to be due to poor recruitment and not timber sale activity or roads (Alt, personal communication).

Poor recruitment can be caused by a number of factors. Elk populations and ratios naturally vary from year to year, and in some cases, the variation is quite significant. There are numerous factors that can influence an elk population and bull/cow cow/calf ratios including weather, predation, previous year effects, and hunting success. There are also numerous factors that can influence the winter trend data. It is difficult to determine which factor may have primary responsibility for a trend in the population numbers or ratios.

1. Has there been an adverse influence on elk populations (numbers and ratios) due to the Forest's repeated HEI amendments?

Based on information and experienced opinions of Montana FWP biologists, there is no evidence that timber sales and open road densities have been having any measurable direct, indirect or cumulative effects to elk herds. Elk populations and bull/cow cow/calf ratios would likely be the same whether the Forest Plan elk effective cover (HEI) standard was achieved or was amended as was done. The only way to conclude that the amendments may have been having some cumulative negative effect would be if MFWP objectives were not being met, and they were responding by altering the elk harvest or requesting adjustment in management of the Gallatin National Forest.

Alt and Hamlin (personal communication) agree that the cumulative effects of timber sales and associated roads are not a factor limiting elk populations in the Madison and Gallatin mountain ranges. Lemke (personal communication) also believes this is true in HD 317 in the Absaroka-Beartooth Range. With the exception of HD 310, these herds exceed elk population objectives in the State Plan and are at high numbers. The Gallatin National Forest has generally high security (good cover) and has good bull/cow ratios.

2. Has there been a change in the distribution of elk due to timber harvest and associated road densities?

It is likely that timber sales and associated roads result in slight elk movements out of the main area of activity during the sale (Lyon et al. pp. 1-3). These movements are generally least in habitats of steep topography, and elk tend to summer in the same locations, such that each harvest area results in a small and localized shift in the local elk population (probably ½ to 2 miles depending on topography, Lyon et al. 1985)). There are always less active or more secure habitats available very near harvest areas.

3. Should the Forest Service manage portions of the Gallatin National Forest at stricter open road density standards to compensate for areas where .70 HEI is not being achieved?

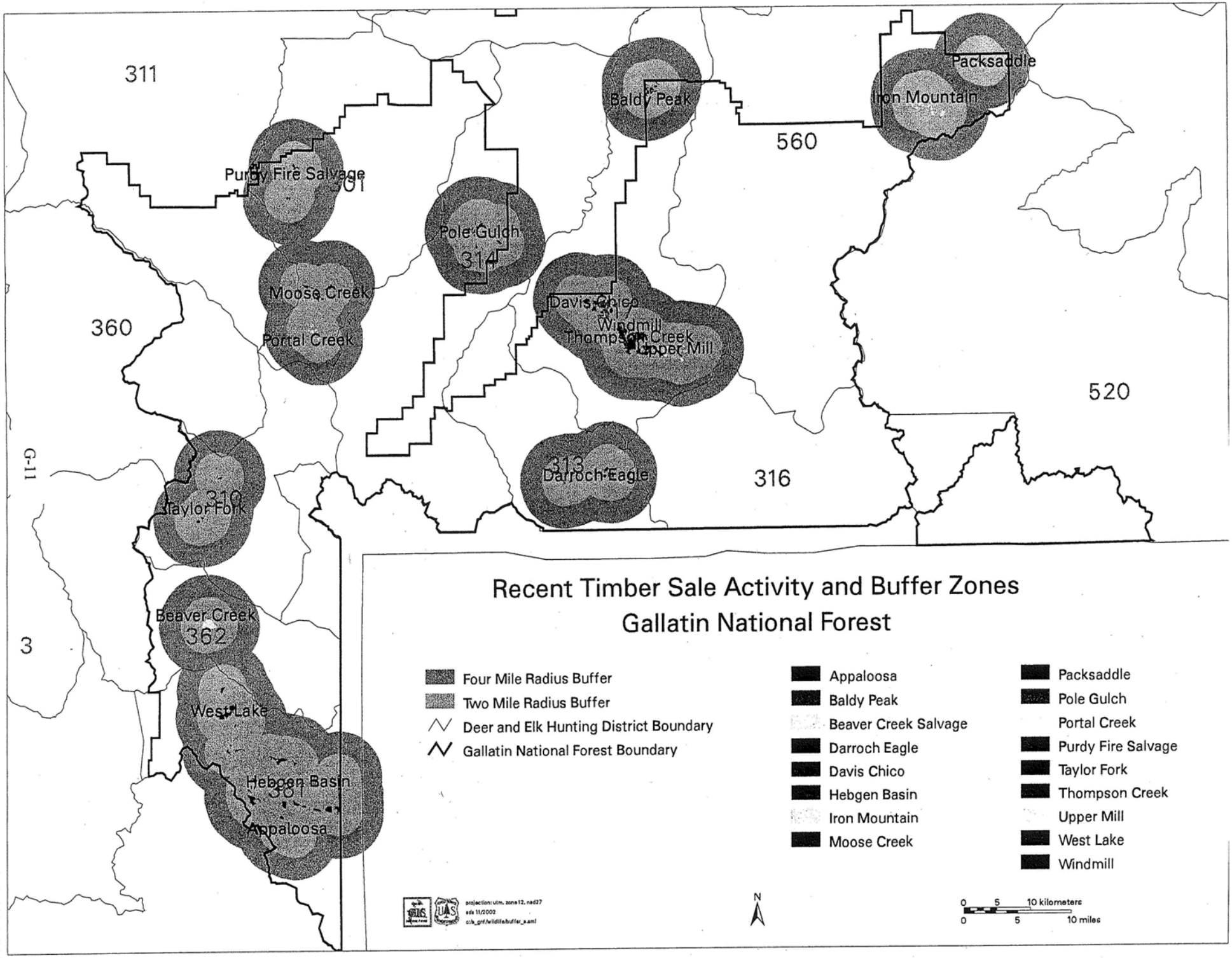
It appears that the main effect that roads can have on elk on the Gallatin National Forest is to allow hunter access. This indirectly affects the elk population by allowing more or less hunters easy access to a population segment and this can alter the bull/cow ratio. The State FWP has conflicting needs when it comes to access. They need access to allow hunters to get into some areas and reduce the total numbers of elk so that the likelihood of depredation on private lands in the winter is reduced, but they also wish to maintain a certain bull/cow ratio in order to maintain hunter satisfaction (Hamlin personal communication). Places where access is insufficient for hunters to remove a reasonable harvest are those where liberal (antlerless) hunts must be used as a tool to reduce depredation.

There are significant Wilderness and roadless acreages available on the Forest, which means that average road densities are somewhat balanced by having large areas of 1.0 HEI. In addition, timber sale areas comprise a relatively minute percentage of the National Forest**.**

Lastly, based on hunting district information discussed above, there is no correlation between achieving State FWP objectives for elk and timber harvest areas where amendments were made to the Forest Plan HEI standard. Populations, bull/cow and cow/calf ratios are good across the Forest in spite of variations in road density within specific areas.

See separate document:
TimberSaleOpenRoadDensityHabitatEffectiveness

Table G-1. See Timber Sale Open Road Density and Habitat Effectiveness


311
Purdy Fire Salvage
301
Pole Gulch
314
Moose Creek
Portal Creek
360
Baldy Peak
560
Packsaddle
Iron Mountain
Davis Chico
Windmill
Thompson Creek
Upper Mill
520
313
Darroch Eagle
316
G-11
310
Taylor Fork
Beaver Creek
362
3
West Lake
Hebgen Basin
381
Appaloosa
Recent Timber Sale Activity and Buffer Zones
Gallatin National Forest
Four Mile Radius Buffer
Two Mile Radius Buffer
Deer and Elk Hunting District Boundary
Gallatin National Forest Boundary
Appaloosa
Baldy Peak
Beaver Creek Salvage
Darroch Eagle
Davis Chico
Hebgen Basin
Iron Mountain
Moose Creek
Packsaddle
Pole Gulch
Portal Creek
Purdy Fire Salvage
Taylor Fork
Thompson Creek
Upper Mill
West Lake
Windmill
projection: utm, zone12, nad27
eds 11/2002
N
0 5 10 kilometers
0 5 10 miles